

INSTRUCTION MANUAL

BK PRECISION

Model 470

CATHODE RAY TUBE TESTER/REJUVENATOR



BK PRECISION

**DYNASCAN
CORPORATION**

TEST INSTRUMENT SAFETY

WARNING

There is a certain amount of danger from **electrical shock** if this equipment is used improperly, or from contacting high voltage in the television set, video monitor, computer terminal, etc. in which the cathode ray tube being tested is installed. This instrument is intended for use only by qualified electronic technicians who are trained to work safely in the presence of high voltage. Be alert to the following hazards when using the **Model 470 CRT Tester/Rejuvenator**:

1. An electrical shock causing 10 milliamps of current to pass through the heart will stop most human heartbeats. Higher voltages pose a greater threat because they can more easily produce a lethal current. However, voltage as low as 35 volts DC or AC RMS should be considered dangerous and hazardous since it can produce a lethal current under certain conditions.
2. Many television sets and other devices with CRT's are transformerless "hot chassis" powered, where one side of the AC power line is connected directly to the chassis. If such equipment does not have a polarized power plug to prevent insertion the "wrong" way, a serious shock hazard exists if the chassis is touched. Additionally, damage to the **CRT tester/rejuvenator** or the TV set could result. Unplug any "hot chassis" TV set from its AC outlet before attempting to access the CRT (just turning off the set does not eliminate the hazard). To be on the safe side, treat all equipment as "hot chassis" type unless you are sure it has a floating or earth ground chassis.
3. Discharge high voltage capacitors after power is removed from the equipment with the CRT. The anode of many CRT's retains a high voltage charge for long periods after power is removed.
4. This instrument applies all the voltages required for testing and restoring CRT's. Therefore, high voltages are present at the adapter socket during some tests. Keep your hands away from the adapter socket during tests. The 470 should be turned off while the adapter is being connected to the CRT.

INSTRUCTION MANUAL

for

Model 470

CATHODE RAY TUBE TESTER/REJUVENATOR

BK PRECISION **DYNASCAN**
CORPORATION

6460 W. Cortland St., Chicago, Ill. 60635

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INTRODUCTION

The Model 470 CRT Tester/Rejuvenator has been designed by B & K-Precision to evaluate most television picture tubes, computer terminal displays, or other cathode ray tubes with a high degree of accuracy. This professional quality CRT tester utilizes a "Road Map" control panel design that radically reduces testing time.

SPECIAL FEATURES:

Each test function has been designed to ensure more rapid testing, in addition to reducing human error. These features include:

1. A control panel which guides the user easily through the correct test sequence.
2. Accurate leakage measurements between all important elements. No controls to adjust.
3. Heater voltage, G1 voltage, and emission current are precisely indicated on large, easy-to-read, colored scales.
4. Continuously variable heater voltage, which can be precisely set on the meter. All common CRT heater voltages are pre-marked on the meter scale. The voltages to G1 and G2 are continuously variable, permitting the tube to be checked under conditions simulating its actual use in the receiver.
5. New color tracking feature; greatly reduces time required for determining proper color gun tracking.
6. A new, greatly improved rejuvenation capability is provided for each gun independently. The entire process is automatically timed and operated by simply depressing the RESTORE button. The rejuvenate feature provides maximum cathode restoration while at the same time minimizing the possibility of cathode destruction.
7. Function switching between REJUVENATION and EMISSION test permits instant evaluation of restoration effectiveness.
8. New, improved, more versatile adapter set is included.

SPECIFICATIONS

TYPES OF CRT'S TESTED: Most black and white and color TV picture tubes, video monitors, and computer terminal CRT's.

TESTS PERFORMED:

- Emission
- Leakage
- Tracking (Color Tubes)
- Life

RESTORING FUNCTIONS:

- Shorts Removal
- Gun Cleaning and Balancing
- Cathode Rejuvenation

METER: (One; 4½", D'Arsonval movement.)

Meter Indications

- Emission (0-2mA)
- Restoring Current (0-2 scale)
- Heater Voltage (0-15V)
- G1 Bias Voltage (0-100V)
- Leakage

TEST VOLTAGES:

Heater: 0-7 @ 2.0A

7-14 @ 600mA

G1 Bias: 0 to Neg. 100 VDC

G2 Supply: 0-450 VDC

ACCESSORIES:

CRT Socket Adapters: 6 supplied; optional adapters available for all common TV picture tubes.

Set-Up Chart: Shows adapter number and test voltages, condensed instructions.

POWER REQUIREMENTS:

117 VAC, 60 Hz, 40 Watts.

FUSE (INTERNAL):

Type 3 AG, 0.3A Slo-Blo.

CASE:

One-piece high impact polyethylene, internal cord and adapter storage.

SIZE:

13½" x 10" x 5-3/4".

WEIGHT:

7 lbs.

SAFETY PRECAUTIONS

1. The proper power line supply voltage is indicated on the chassis where the power cord enters the instrument. Do not attempt to operate this instrument from a power source other than specified.
2. When testing any CRT that is installed in a chassis, *first disconnect the chassis power plug from the AC line outlet. Do not apply power to the TV chassis at any time during the test of a CRT.*
3. Read and observe the “Test Instrument Safety” recommendations on the inside front cover of this manual.

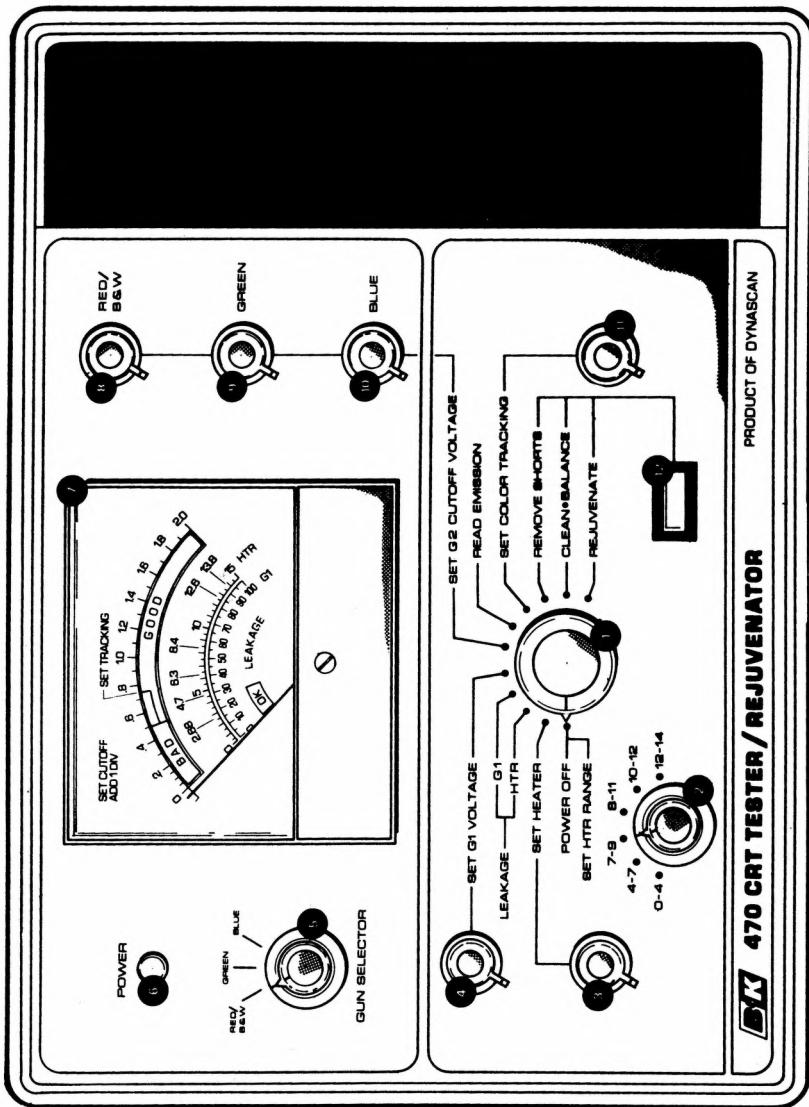
BRIEF SUMMARY OF WHAT THE 470 WILL DO

The Model 470 CRT TESTER/REJUVENATOR will:

1. Rapidly test a cathode ray tube for satisfactory emission.
2. Restore tubes having low emission.
3. Check for shorts or leakage between the elements in the tube, and also indicate between which elements the fault exists.
4. Check relative cathode emission, to rapidly indicate balance (tracking) between the guns of a color CRT.
5. Check the life expectancy of the tube.
6. Repair the most common shorts in cathode ray tubes: those between cathode and G1.

CONTROLS AND INDICATORS

1. FUNCTION SELECTOR SWITCH:	OFF, SET HEATER, HEATER LEAKAGE, G1 LEAKAGE, SET G1 LEAKAGE, SET G1 VOLTS, SET G2 CUTOFF, READ EMISSION, SET COLOR TRACKING, REMOVE SHORTS, CLEAN•BALANCE, REJUVENATE
2. HEATER RANGE SWITCH: Coarse adjustment of heater voltage.	0-4, 4-7, 7-9, 8-11, 10-12, 12-14 Volts.
3. HEATER FINE ADJUSTMENT:	±2 Volts variable.
4. G1 VOLTAGE ADJUSTMENT:	0 to NEG. 100 VDC.
5. COLOR GUN SELECTOR SWITCH:	Red/B&W, Green, Blue.
6. PILOT LAMP:	Indicates power ON.
7. METER:	Indicates—Heater Voltage, Leakage, G1 Volts, Emission, Tracking, Cleaning, Balancing, Rejuvenation.
8. G2 RED/B&W VOLTAGE ADJUSTMENT:	0 to 450 VDC.
9. G2 GREEN VOLTAGE ADJUSTMENT:	0 to 450 VDC.
10. G2 BLUE VOLTAGE ADJUSTMENT:	0 to 450 VDC.
11. TRACKING ADJUSTMENT:	Varies emission readings of all guns proportionally from zero to full value.
12. RESTORING PUSHBUTTON:	Applies restoring voltage between G1 and cathode, and simultaneously interrupts heater voltage.



Controls and indicators.

USING THE MODEL 470

INTRODUCTION

The following procedure describes in detail the use of the 470. In addition, comments and notes are provided regarding the significance of the readings to aid the user in interpreting the measurements obtained.

Because of the unique design of this instrument, all tube types are tested in the same manner regardless of gun structures. After the user has become thoroughly familiar with the instructions and the instrument itself, he will need only to refer to the SET-UP CHART booklet.

HOW TO USE THE SET-UP CHARTS

For convenience, color and black/white CRT's are grouped separately. In each group the tubes are listed first in increasing numerical order by screen size, whether in inches or millimeters; then in alphabetical order, by the letters following the screen size.

Foreign tubes having alphabetical prefixes are listed at the end of the listing of tube types having numerical prefix identification.

OPERATION

(Refer to Control Panel Illustration)

A. SET-UP:

1. Set function switch (1) to the OFF position.
2. Plug the Model 470 line cord into a convenient power outlet.
3. Set all variable controls fully counterclockwise.
4. Locate the type number of the CRT to be tested in the SET-UP CHART.
5. Select the adapter by the number indicated and connect it to the adapter cable.
6. Set the HTR RANGE Switch (2) to the range which includes the heater voltage shown in the SET-UP CHART.
7. If the CRT to be tested is mounted in the TV set, *make sure that power to the TV set is removed*, preferably by unplugging the set. A shock hazard and possibility of damage to the 470 exists if an attempt is made to test the CRT with the TV set operating.
8. Connect the socket adapter to the base of the CRT, taking care to align keyway properly.
9. Rotate the function switch to SET HEATER position.
10. Carefully adjust the SET HTR control (3) while observing the HTR VOLTS scale of the meter (7) for the heater voltage indicated in the SET-UP CHART. For convenience, the most common heater voltages are precisely marked.

B. LEAKAGE TEST:

1. Rotate function switch (1) to HTR LEAKAGE. Leakage between HTR and cathode is okay if the reading on meter (7) is within the yellow area of the bottom scale marked Leakage. For color tubes only, rotate GUN SELECTOR switch (5) to the other two guns.
2. Rotate function switch (1) to G1 LEAKAGE. Leakage between G1 and cathode is okay if the reading of meter (7) is within the yellow area of the bottom scale. For color tubes only, rotate GUN SELECTOR switch (5) to the other two guns.

NOTE

Heater-Cathode Leakage: Leakage between heater and cathode cannot be repaired. When such a leakage is determined to be the cause of set malfunction, it is necessary to replace the picture tube. If the TV heater power source permits the use of an isolating transformer, its use may restore normal operation.

Grid-to-Cathode Leakage: Excessive leakage or a short between the control grid and cathode is a common fault in picture tubes. Any current path below two megohms will cause the meter to read excessive leakage (near full scale or higher). If only leakage is indicated, restore the tube by using the CLEAN•BALANCE procedure; if a G1-K short exists, use the REMOVE SHORTS procedure (see "RESTORING THE PICTURE TUBE").

C. SET G1 VOLTS:

Rotate function switch (1) to SET G1 VOLTAGE position. Set G1 VOLTAGE to the value specified in the SET-UP CHART (50V unless indicated by*). Use G1 control (4) and read voltage on G1 Voltage Scale of the meter.

D. SET CUT-OFF:

1. Rotate function switch to the SET CUT-OFF position. The meter should read zero or slightly above or below zero.
2. Slowly advance each of the three G2 controls (8), (9), and (10) clockwise until the meter rises one small division of the meter scale. Use gun selector switch (5) corresponding to each G2 control. This adjustment sets the G2 voltage at the value for spot cut-off of each color gun. If a tube or gun cannot be brought out of cut-off by advancing the G2 control fully clockwise, check for presence of glowing heater. If heater is glowing proceed to REJUVENATE (see "RESTORING THE PICTURE TUBE").

NOTE

For black and white tubes, use only the RED/B&W G2 control.

E. EMISSION TEST:

Rotate the function switch (1) to the **READ EMISSION** position. The meter will indicate the cathode emission current for each of the three electron guns. Use the **GUN SELECTOR** switch (5) to check each gun. In some instances, the meter may read somewhat beyond the full scale deflection. This indicates that the tube has excellent emission. A greater than full scale reading will not in any way damage the instrument. In some cases, the current may rise to approximately 1/2 or 3/4 scale and then slowly decrease. Evaluation of emission should be made when the readings have stabilized. In all cases, if the emission readings stay well within the green (GOOD) area, the emission characteristics of the tube may be considered acceptable. If emission reads in the red (BAD) area, proceed to **REJUVENATE** (see "RESTORING THE PICTURE TUBE").

F. TRACKING TEST:

1. Rotate the function switch (1) to the **SET COLOR TRACKING** position.
2. Rotate the **TRACKING** knob (11) so that the pointer of the highest gun reading coincides with the **SET TRACKING** line located at the high end of the yellow wedge on the meter scale.
3. Observe the other two gun readings by using the **GUN SELECTOR** switch (5), and note if they are within the yellow tracking wedge on the meter. If all three readings are within the yellow wedge, the tracking ratio of the CRT is acceptable. If the tube does not track, proceed to **CLEAN•BALANCE** (see "RESTORING THE PICTURE TUBE").

G. LIFE TEST:

Judgement of life expectancy is obtained by observing the "warm-up" and "cool-off" behavior of the cathode. To make these observations in the **EMISSION** position, depress the pushbutton (12). This interrupts the heater circuit and makes it possible to observe the rate at which the emission rises and falls as the cathode heats up and cools down. Use the **GUN SELECTOR** switch (5) to observe each gun.

If, for instance, during warm-up, one gun reaches full emission much slower than the other two, it is an indication that there may be very little good material left on that cathode, or that its heater has been dislodged away from the cathode causing lower than normal cathode temperature. In either instance, it is a further indication that short life may be expected from that gun. A good tube will reach full emission levels and *will track* within two minutes.

Similarly, the "cool-off" characteristic can provide another clue for judging life expectancy. Observe the time it takes for emission from each gun to fall after the heater voltage is interrupted. If, for instance, two guns maintain full emission for 7 to 10 seconds, and the third gun falls rapidly after 3 or 4 seconds, short life can be expected from that gun.

RESTORING THE PICTURE TUBE

The Model 470 employs three restoring functions: REMOVE SHORTS, CLEAN•BALANCE and REJUVENATE.

LEAKAGE AND SHORTS: Excessive leakage (mid-scale reading) is most successfully removed by the CLEAN•BALANCE procedure.

Low resistance or a short between the control grid and cathode will show up in the LEAKAGE test (high or full scale meter reading). This kind of short can usually be removed by the REMOVE SHORTS procedure.

A. REMOVE SHORTS:

1. Set the function switch (1) to the REMOVE SHORTS position.
2. Set GUN SELECTOR switch (5) to the desired gun.
3. Depress the pushbutton (12) and release.
4. Return the function switch to G1 LEAKAGE. The meter will indicate whether or not the short has been removed. Repeat steps 1, 2 and 3 if necessary.
5. After the short is removed, resume the testing procedure.

CLEANING, BALANCING AND REJUVENATING

Cleaning and balancing is a low energy restoring operation. It can be used safely on all tubes to eliminate surface contamination causing high resistance leakage or for further improving the emission of a fairly good cathode to restore tracking or to increase life expectancy. Rejuvenation is a higher energy procedure for restoring cathodes when the emission is below usable levels.

High level rejuvenation of one gun can occasionally reduce the previous emission reading of another gun, particularly if that gun had just been rejuvenated. Therefore, after rejuvenation, it is often desirable to "touch-up" by cleaning and balancing one or more of the guns in order to achieve good tracking.

A. CLEAN•BALANCE:

1. Set the function switch (1) to the CLEAN•BALANCE position. Wait 20 to 30 seconds. Observe the CRT heater for increased brightness from the higher heater voltage. Set the GUN SELECTOR Switch (5) to the desired gun.

2. Depress and hold the pushbutton (12). The meter should rise immediately to a value near midscale. After several seconds or more, depending upon the condition of the cathode, the pointer will begin to fall. It usually will fall smoothly to some low value.
3. Release the pushbutton when the pointer reaches 0.2. If the pointer drops erratically and then "hangs-up" at a reading greater than 0.2, wait several seconds and then release the pushbutton.
4. Return the function switch (1) immediately to G1 LEAKAGE (If LEAKAGE was being removed), or to READ EMISSION (if balancing or "touch-up" was being done). Resume testing.
5. If the CLEAN•BALANCE procedure was not successful and the condition of the CRT is still unsatisfactory, use the REJUVENATE procedure.

B. REJUVENATE:

1. Set the function switch (1) to the REJUVENATE position. Wait 20 to 30 seconds. Set the GUN SELECTOR Switch (5) to the desired gun.
2. Depress and hold the pushbutton (12). The pointer immediately will rise to about 3/4 scale. After several seconds, the pointer will begin to fall. Often the pointer will fall erratically or hesitate near midscale and then rise slightly before continuing to fall. This behavior is usually accompanied by observable sparking and sputtering action between the grid and cathode.
3. Release the pushbutton when the pointer reaches 0.4 or just as it crosses into the red area of the meter. If the meter reading does not fall to 0.4 after several seconds, release the pushbutton immediately.
4. Return to read EMISSION. Allow time for readings to stabilize. A rapid judgement of relative improvement can now be made. For greater accuracy, repeat SET G2 CUTOFF voltage.
5. Repeat LIFE and TRACKING tests. If slight further improvement is needed, or if rejuvenation caused lower emission from one of the other guns, use the CLEAN•BALANCE procedure.
6. If the CLEAN•BALANCE procedure after rejuvenation does not give the necessary improvement, repeat REJUVENATE. Most cathodes will achieve 90% or more of the possible improvement in a single operation. Some will require two or three cycles of rejuvenation for maximum improvement. Further rejuvenation generally causes lower emission and shorter life. The fewer rejuvenation cycles that are used to achieve satisfactory emission, the greater will be the life expectancy.

NOTES

If the meter pointer does not rise when the pushbutton is pushed, it indicates that successful rejuvenation is probably not possible. If the reason for lack of emission is an extremely inactive (contaminated) cathode, it is sometimes possible to start the rejuvenation process by applying even higher heater voltage than normally used for rejuvenation. To try this, go back to SET HEATER and increase the heater voltage approximately 25% above the *normal* setting (8.0V for 6.3V tubes). Then return to REJUVENATE and attempt rejuvenation. Since the tube is not useful anyway, the risk is small. The greatest danger is that excessive heater voltage will expand the cathode so far that a short to G1 will be created. Also, of course, the heater itself could be burned open by the higher voltage, although this occurs less frequently than a short.

If all three guns show initial low emission (BAD), rejuvenation of one gun will often result in some improvement of the other two guns. (This is caused by the elevated heater voltage which is a mild form of rejuvenation in itself.) These guns should also be rejuvenated, however, even though the emission may have been improved enough so they read in the GOOD region.

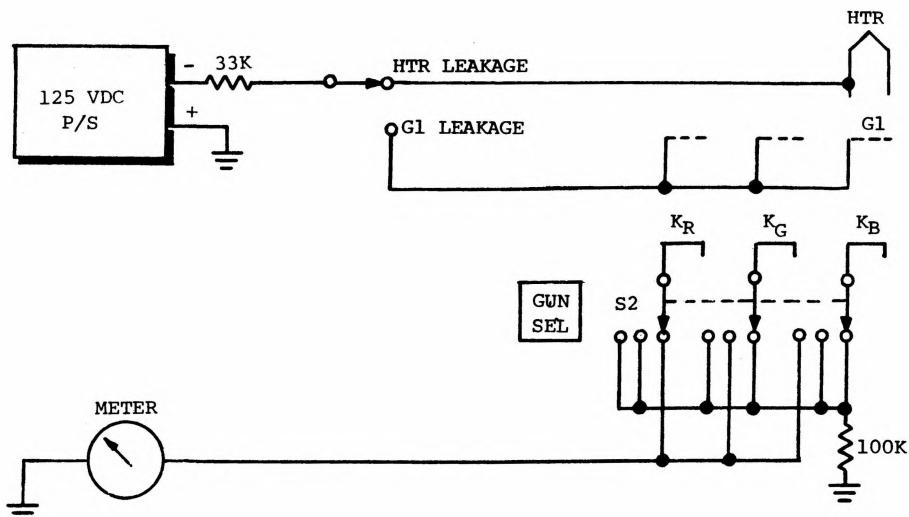


Fig. 1. Leakage test circuit.

THEORY OF OPERATION

LEAKAGE TEST

The leakage limit scale in the Model 470 is more liberal than the manufacturer's limit for a new tube. This is the limit at which you might expect trouble to begin showing up in a typical TV set.

In both leakage positions, a high sensitivity meter clearly indicates the acceptable leakage limits. (See Fig. 1.)

QUALITY TESTS (G2 CUTOFF, EMISSION AND TRACKING)

The current indicated on the Model 470 meter is "true" beam current - that is, only the current passing through the G1 aperture. A GOOD emission indication on the meter, therefore, assures that (given the high voltage), the CRT gun is capable of producing adequate high-light brightness on the face of the picture tube.

Three individual G2 controls are adjusted accurately for spot cutoff for each color gun. These controls are sufficiently low resistance to avoid regulation problems in the emission test. (See Fig. 2.)

The top scale of the meter is calibrated in millamps of true beam current. This current may be read in microamperes by simply multiplying the scale reading by 1000. In some instances the meter may read somewhat beyond the full scale deflection. This indicates that the gun has extremely high emission current. Current readings greater than full scale will not damage the Model 470 instrument.

Proper gray scale tracking in color television receivers can only be accomplished if the three guns of the CRT can supply emission currents which are within a certain ratio to each other. Manufacturer's specifications for this ratio provide that no current can be greater than 150% of any other current. The Model 470 provides an accurate tracking test which greatly simplifies color CRT evaluation.

SHORTS REMOVAL

Picture tube guns are constructed with extremely small spacing between the cathode and the G1 (control) electrode. This close spacing, together with the possibility of the cathode coating material becoming loose and bridging the gap between the cathode and the control grid; often results in a fairly low resistance short between these elements. The presence of such a short will be immediately detected in going through the normal test sequence in the LEAKAGE position.

Such a short usually can be eliminated by means of a high energy discharge from a capacitor. Moving the Function Switch to REMOVE SHORTS position and pressing the pushbutton, places a capacitor (previously charged to high voltage) across the

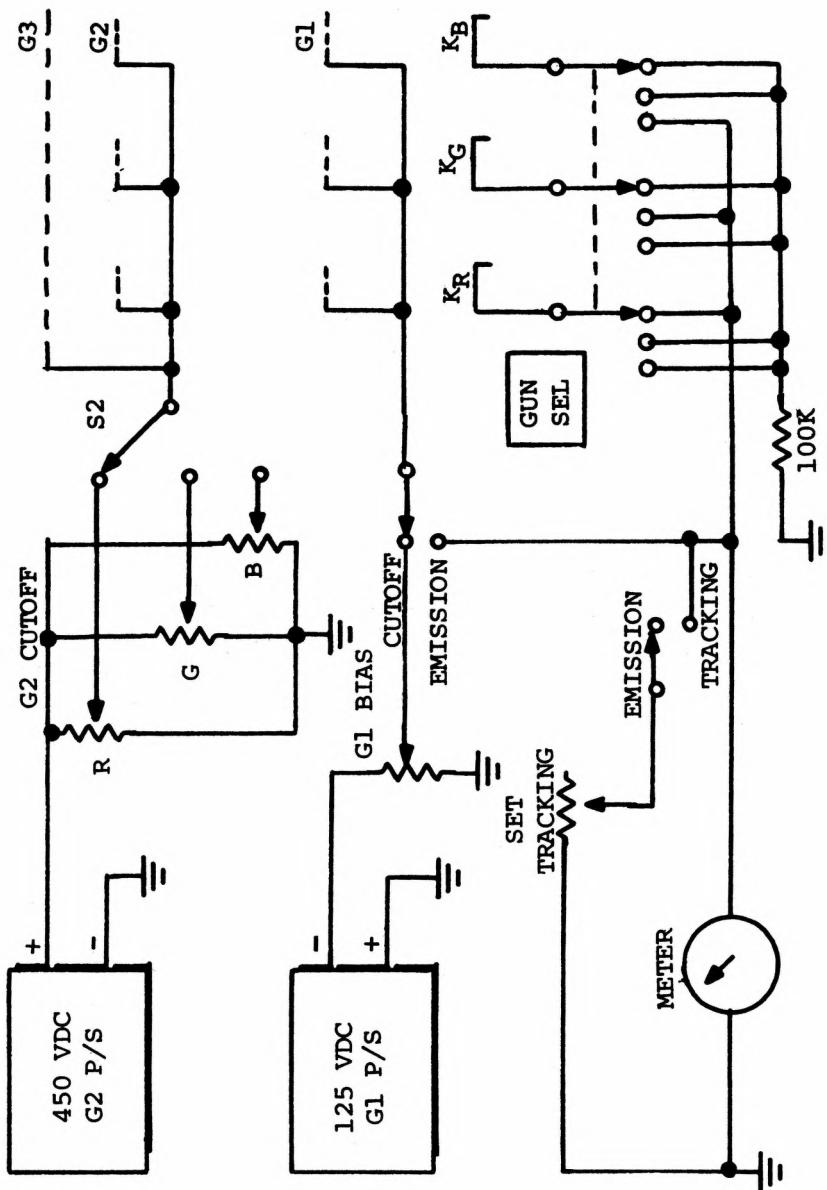


Fig. 2. Cut-off, emission and tracking test circuit.

short. When the short has been successfully burned out, low leakage will be indicated in the leakage test. (See Fig. 3.)

CATHODE CLEANING AND RESTORING

The most effective technique for cathode rejuvenation, involves elevating the heater voltage and simultaneously applying a high positive voltage between G1 and cathode, thus causing a much greater than normal cathode current to flow. Unfortunately, unless this process is carefully controlled the cathode can easily be damaged and instead of improving performance, the emission capability of the cathode is lowered or destroyed.

This problem is avoided in the Model 470 by pre-heating the cathode, and then initiating the rejuvenation cycle by means of a pushbutton which applies the high rejuvenation voltage to the control electrode, and simultaneously removes the heater voltage. This permits a high rejuvenation current to begin flowing immediately as the button is pressed, but permits the current to flow only as long as the cathode retains sufficient heat to maintain the temperature required for emission. The rejuvenation cycle is therefore automatically terminated when the cathode cools below the point at which emission can be sustained. This time interval will depend upon both the condition of the cathode emitting surface, and the thermal characteristic of the cathode structure. The larger, more rugged cathodes will result in a longer rejuvenation cycle and, of course, they are the ones that need and can withstand the longer time interval, with less danger of being damaged. Therefore, the cathode structure itself serves as the automatic timing element, that adjusts the timing interval according to its own needs. (See Fig. 4.).

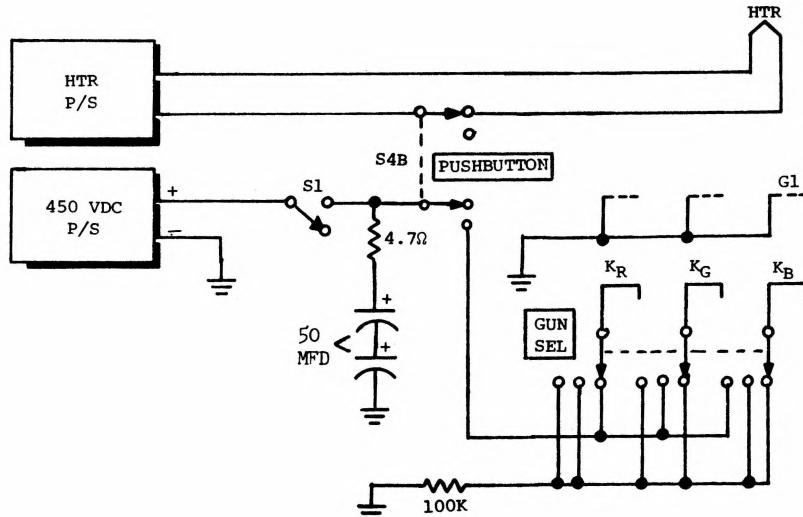


Fig. 3. “Remove Shorts” circuit.

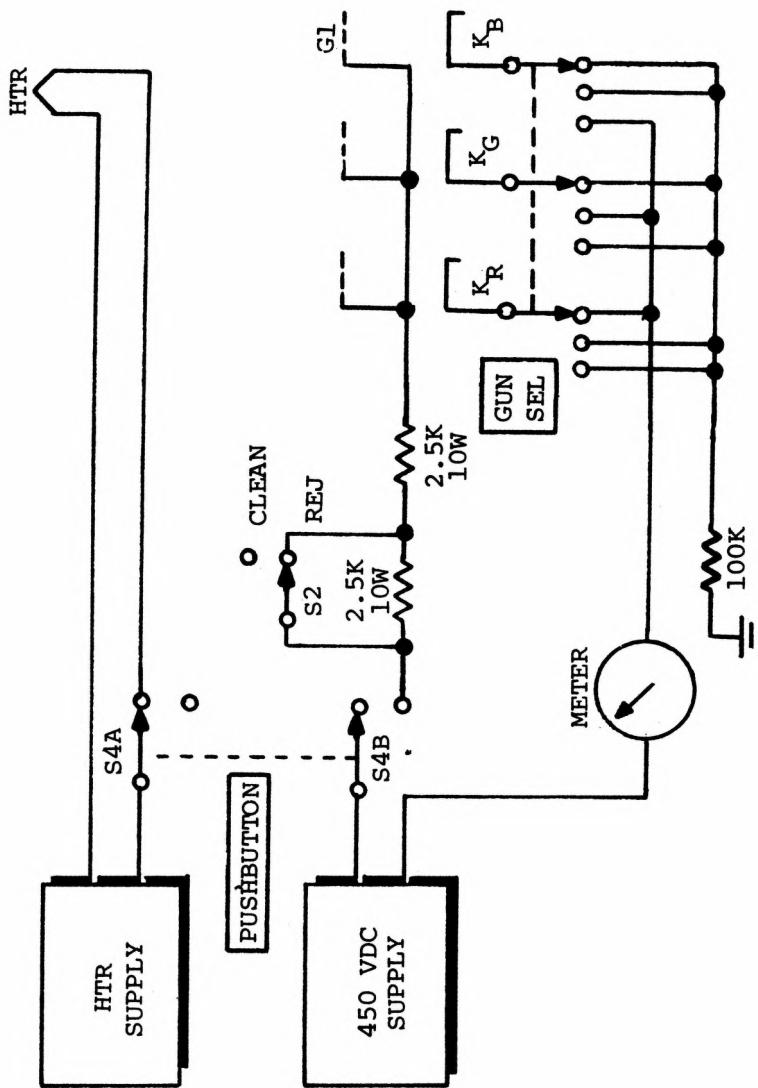


Fig. 4. Clean Balance and Rejuvenate circuit.

SERVICING

WARNING

1. The following instructions are for use by qualified personnel only. To avoid electric shock, do not perform servicing other than contained in the operating instructions unless you are qualified to do so.
2. High voltage up to 500 volts is present when this unit is operating. Line voltage (120 or 240 VAC) is present on some components any time the 470 is connected to an ac power source, even if turned off. Always observe caution when the chassis is removed from the housing. Contacting exposed high voltage could result in fatal electric shock.

FIELD CALIBRATION

1. Connect suitable AC voltmeter ($\pm 3\%$ or better) to pins 1 and 14 of Adapter No. 3. Connect Adapter to test cord.
2. Set AC voltmeter range switch to 10V.
3. Plug in 470 and set function switch to SET HEATER.
4. Set HTR Range switch to 4 – 7 volts.
5. Adjust SET HTR control to read exactly 6.3V on external voltmeter.
6. Adjust R7 (located on printed circuit board) so that the 470 meter indicates exactly 6.3V.

WARRANTY SERVICE INSTRUCTIONS
(For U.S.A. and its Overseas Territories)

1. Refer to the MAINTENANCE section of your **B & K-Precision** instruction manual for adjustments that may be applicable.
2. If the above-mentioned does not correct the problem you are experiencing with your unit, pack it securely (preferably in the original carton or double-packed). Enclose a letter describing the problem and include your name and address. Deliver to, or ship PREPAID (UPS preferred in U.S.A.) to the nearest **B & K-Precision** authorized service agency (see list enclosed with unit).

If your list of authorized **B & K-Precision** service agencies has been misplaced, contact your distributor for the name of your nearest service agency, or write to:

B & K-Precision, Dynascan Corporation
Factory Service Operations
4050 North Ravenswood Avenue
Chicago, Illinois 60613
Tel (312) 327-7270
Telex: 25-3475

Also use this address for technical inquiries
and replacement parts orders.

LIMITED ONE-YEAR WARRANTY

DYNASCAN CORPORATION warrants to the original purchaser that its **B & K-Precision** product, and the component parts thereof, will be free from defects in workmanship and materials for a period of one year from the date of purchase.

DYNASCAN will, without charge, repair or replace, at its option, defective product or component parts upon delivery to an authorized **B & K-Precision** service contractor or the factory service department, accompanied by proof of the purchase date in the form of a sales receipt.

To obtain warranty coverage in the U.S.A., this product must be registered by completing and mailing the enclosed warranty registration card to **DYNASCAN, B & K-Precision**, 6460 West Cortland Street, Chicago, Illinois 60635 within fifteen (15) days from the date of purchase.

Exclusions: This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. It is void if the serial number is altered, defaced or removed.

DYNASCAN shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific rights and you may also have other rights which vary from state to state.

For your convenience we suggest you contact your **B & K-Precision** distributor, who may be authorized to make repairs or can refer you to the nearest service contractor. If warranty service cannot be obtained locally, please send the unit to **B & K-Precision** Service Department, 4050 North Ravenswood Avenue, Chicago, Illinois 60613, properly packaged to avoid damage in shipment.

B & K-Precision Test Instruments warrants products sold only in the U.S.A. and its overseas territories. In other countries, each distributor warrants the **B & K-Precision** products which it sells.

BK PRECISION
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